KNOWLEDGE
AN ILLUSTRATED
MAGAZINE OF SCIENCE
PLAINLY WORDED—EXACTLY DESCRIBED

LONDON: FRIDAY, MARCH 2 1883.

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Science and Art Gossip.

PROFESSOR HUXLEY has indicated at Liverpool his views as to education. I fear that they are hardly more practical than those which have been derived from the monastic times, when the student was, as a rule, a recluse. Huxley's ideas of what a boy should be taught express well enough what many of us who obtained instead what Rousseau spoke of as "the trash *called* education," would much rather have learned. Or rather we wish we had then learned what would now be so much more useful than the nonsense actually taught in those times—and perhaps still.

FOR our own part, we believe that no one man—not even a Spencer—can formulate a system of education which would be good even for the average boy, still less could a system good for all be indicated. That much of the rubbish forming part of our modern system of education (the fault of which is that it is of mediæval origin) might incontinently be swept away with immense advantage, every one may admit. But a really good and effective system of education must be the development of many years and of many minds.

OF course, fogeydom is always ready with the argument that our system of education must be good enough, since we owe to it our statesmen, authors, men of science, and so forth. It would be truer to say that they have come despite the system; and indeed, it can scarcely be imagined how any system could be bad enough to prevent men of power and genius from making their way to the front. If our boys were set in rivalry at chess and draughts instead of mathematics, and at *bouts rimés* instead of classics, the best would come to the front, and, manhood reached, would forget their gambits and their verse tricks, and enter on the work of life no better and no worse prepared than they are now.

MANY who have visited Mr. Whistler's collection of etchings (containing enough evidence of his real power to convict him of wilful whimsicality) have been driven away by the wonderful colours of the furniture—a veritable study in hyper-æsthetic monomania.

THE *Oxford Chronicle and Bucks and Berks Gazette* considers the few words we added to the paradox columns (p. 92), showing that the illumination of the solar system is equal at all distances from the sun, very shifty, very feeble, and very spiteful (showing afresh our *animus* against that interesting theory). Our real fault was in remarking at all on a such theory. It should have been clear that anything like argument would be thrown away on any one who could accept it. For our contemporary's benefit we merely note that what the *Oxford Chronicle* describes as the foolish perspective theory is the only true theory of brightness—the illumination at any point of any surface by the sun is precisely measured by the apparent size and brightness of the sun as it would be seen by an eye placed at that point. We merely tell our contemporary this, without in the slightest degree expecting that he (Is a contemporary he, she, it, or they?) will accept it. We may also state that the loss of light by atmospheric absorption in a room of ordinary size is inappreciable. It may be better worth to explain that there is no physicist named Sir W. Thompson, that the men of science named in the comments in our paradox columns are not "politicians," and that, besides the three or four astronomers and physicists whose views on special points have been controverted or questioned in these columns, there are hundreds of astronomers and physicists whose views have not been controverted here. To persons who know Sir W. Thomson as Sir W. Thompson and Sir J. Herschel as Sir J. Herschell, the names of the astronomers and physicists of our time are probably unfamiliar, so we will not waste our space in naming any of them here. It may be worth adding that even in those cases where we have pointed out what appear to us as errors, we cannot be fairly described as attacking persons. For example, we had occasion to assert, and were able to prove, that there had been errors in Sir George Airy's treatment, in 1857 and 1868, of the late transits of Venus; yet we regard Sir George Airy as one of the best official astronomers this century has known. He was so zealous in his work as Astronomer-Royal, that few would have cared to hold the office after him. So of others; though, by the way, can our intelligent contemporary indicate what particular views of Professor Stokes in matters physical we have controverted or attempted to controvert here?

"IN view of the long-continued wet weather, whereby agricultural operations have been retarded," the President of the Wesleyan Conference recommends united prayer, "that God may be pleased to grant us a season of fine weather, so that the seed may be committed to the soil." The observer of nature who recognises no instances in which the order of nature is departed from in response to prayer, is commonly rebuked as irreligious; but it may be questioned whether there is anything nearly so irreligious in patiently waiting till, in the course of nature, a desired change of weather is brought about, as there is in venturing to tell a Being worshipped as All-Knowing and All-Powerful, that *now* the time is approaching when the seed ought to be committed to the soil, and that the wet weather has continued quite long enough.

ONE might suggest as a useful subject for consideration by well-minded persons the profanity of certain prayers—

XUM

as prayers for profit, for the punishment of persons not pleasant to us, and so forth, til we reach some not so obviously profane.

Yet so long as the laws of nature are imperfectly known, these special impertinences towards the God of nature will continue. No one, nowadays, would think of praying that the action of gravity should be suspended (any more than a reasonable being would ask God to

> Annihilate both time and space
> To make two lovers happy),

for the action of gravity has been investigated and measured; nor would any one pray that a chemical or physical experiment should turn out in a particular way in order that a favourite theory might be supported. But, outside the recognised operations of natural law, in the domain of the unknown, men still feel free to pray without offence—though if they worded their prayers logically they might run somewhat as follows:—"Grant that these processes which I cannot comprehend" (whether meteorological phenomena, or the progress of disease, or commercial and industrial influences) "may be so working as to lead to the end which I (not that *I* know what is best for me) particularly desire."

In many parts of Switzerland, the Geneva correspondent of the *Times* says, are often found smooth flat stones, evidently hand published, and covered with dots, lines, circles, and half-circles. The origin and use of these stones, known among country people as *Schalensteine*, have long been a moot point among the learned. Herr Rödiger, of Bellech, in Solothurn, says *Schalensteine* are neither more nor less than topographical charts, as a comparison of them with any modern map of the districts in which they are found will show. The engraved dots correspond with existing towns and villages, the lines with roads. Even the fords and mountain passes are indicated. Herr Rödiger has examined many of these stones from various parts of the country, and he possesses a collection, picked up in Solothurn, which form together a map of the entire canton. Another significant circumstance is that the *Schalensteine* are mostly found at intervals of about two hours—say, six miles—from each other, and at spots where several roads meet. The former Herr Rödiger calls "headstones"—*Hauptsteine*—the latter he denominates "by-stones"—*Nebensteine*. If he be right in his hypothesis, the places where these stones are met with possessed considerable populations long before the dawn of history; even the villages shown on the *Schalensteine* must be far older than the Christian era.

There are papers aiming at and claiming, but not always reaching, a high and dignified position, which do not always treat people fairly. I remember being blamed in the pages of such a paper for claiming in my book on the Sun "every scrap of theory to which I might be entitled;" and when I wrote five lines in reply, saying there was not such a claim, good, bad, or indifferent, throughout the volume, getting no better satisfaction than the reply from the editor that it was not the justice of my claims but the advisability of making them that was in question—an odd reply, where I had denied making any claim at all. Now recently, I have had experience of very different treatment in the columns of a paper not claiming, I believe, the high and dignified tone of such papers as—let us say—the *Athenæum*. A writer in the *Sporting Times*, adopting the worthy title Philalethes, or Truth-Lover, had rejected with scorn and contumely some items of information contained in a recent number of Knowledge. I was moved to reply, and at some length. I am satisfied my reply would have found no place if it had been addressed to some exceedingly high-toned papers in which an unfair attack had been made. But it was inserted at once in the *Sporting Times*. The following extracts from it will show what statements were questioned, and how they were maintained.

"As for the moving *dune* in Nevada," Knowledge, No. 66, p. 63, "it is a true bill. I had heard of it when in that neighbourhood myself from several scientific authorities; Mr. Monroe, who reports the movement, is an eminent surveyor; the account is confirmed by the editor of the *Scientific American;* I have stood on a similar, though smaller, sand mountain in New Zealand; and lastly, no one who has ever seen the sand *dunes* of the Landes, and heard what has happened there, will deem the story very marvellous. There, not only have millions of tons of sand advanced inland at an average rate of seventy-two feet, but each year three million cubic feet of sand advances (as it were, from beneath the sea) upon the coast; or, putting thirty cubic feet of sand to the ton (about a five-inch cube of sand to the pound avoirdupois), a million tons of new sand are added each year to the invading mass. In violent storms, whole villages have been destroyed in a few hours; the town of Mimizan, after thirty years' contest with the advancing sands, is now nearly buried beneath them."

"As for the cunning toad story" (same number of Knowledge), its defect is that it is so easily explained, without imputing wonderful intelligence to the toad. Toads seek their food where they know it is likely to be found. In this case a toad, finding the insects gathered round saucers of moistened meal, simply hid itself under the meal, and caught them from that coign of vantage. The humour of the chickens in taking their meal off the toad's back, instead of visiting the other saucers, was to me far the best part of the story. And, talking of intelligence and humour in animals, none of the stories we read give half the evidence of character and fun in animals that every one who is at all observant can find in the general ways of animal friends. I have had dog friends who have told me more in a day's walk about canine intelligence, by a number of little ways and dodges severally too slight to be worth telling, than one could gather from a dozen volumes of animal intelligence stories; while, as for fun, the thought of some of the odd tricks of two particular friends of mine, both black retrievers, is as good to me in its way as a volume of Mark Twain or Artemus Ward."

"The stinging-tree is only too certain a fact, as many know to their cost. 'Philalethes,' however, considering the name he takes, should not have said that our correspondent described the tree as 'rushing out and stinging persons.' 'We often came into contact with them,' can hardly bear that meaning. Several years ago, President Barnard, of Columbia College, New York, gave a very interesting account (at the table of the late Professor H. Draper), of his own unfortunate experience with one of the stinging trees of America."

"Lastly, the question of the chirping, or, rather, tapping, spider is under discussion in the pages of Knowledge. The death watch has been suggested in explanation of what was observed, but the death watch is a coleopterous insect, not a spider or arachnoid."

THE GREAT COMET OF 1882.—I.*

BY PROFESSOR C. A. YOUNG.

THE comet which is fading in the morning sky is one of the most interesting that has ever appeared. Few, if any, have ever been more brilliant, and though others have been larger, and have continued visible for a longer time, none of them have presented more remarkable phenomena.

Of late we have been much favoured in the matter of bright comets. According to the list given by Humboldt in his "Cosmos," it appears that the average interval between such apparitions for the last five centuries has been something like eight years. During the last fifty years the frequency has been about the same, conspicuous comets having appeared in 1835, 1843, 1858, 1861, 1862, and 1874. But since the beginning of 1880 we have already had five which were visible to the naked eye, and three of them comets of the highest rank. The comet of 1880 was indeed visible only in the southern hemisphere; but we all remember the fine comet which appeared in June, 1881, and was not much, if at all, inferior to the present one. Schäberle's comet, which followed in August, would have been regarded as very satisfactory had its predecessor been less brilliant; and Wells's comet of last summer, though not well seen in the United States, was a very respectable comet in South Africa.

It is not yet certain when or where the present comet was first seen, but, so far as now appears, the priority belongs to Dr. Gould, or one of his assistants, at the observatory of Cordoba, in South America. In a private letter to Mr. Chandler, of Cambridge, mainly occupied with other matters, Dr. Gould, under date of September 15th, mentions that a brilliant comet had been visible there near the celestial equator for "more than a week." He had already made two observations, and was waiting for clear weather again in hopes of being able to catch it on the meridian. This would put its discovery on or before Sept. 7. It was seen on the 8th by Mr. Finlay, an assistant in the Royal Observatory at the Cape of Good Hope; and on the 12th it was observed at Rio Janeiro by Cruls, who telegraphed the news to Europe, announcing it (erroneously) as the expected comet of 1812 on its return. We have not yet sufficiently full accounts from the southern observatories to know whether it was lost sight of at all after its discovery, but we have the account of a most interesting and unprecedented observation made at the Cape Town Observatory on the 17th. Mr. Gill, the director of the Observatory, writes:—"The comet was followed by two observers with separate instruments right up to the sun's limb, where it suddenly disappeared at 4 h. 50 m. 58 s. local mean time." This was about an hour and a half before its perihelion passage.

A few hours previously it had been independently discovered by Mr. Common, in England, in the full blaze of sunlight, and clouds alone prevented him from making the same observation as Mr. Gill.

It is evident that the comet must have been most intensely brilliant to be visible under such circumstances. When it passed on to the sun's disc (it was between us and the sun at the time), it disappeared, being either transparent, or else practically as bright as a portion of the sun's own surface. If this comet had been in the place of the little "Tewfik" which was seen close to the sun at the time of the Egyptian eclipse last May, it would have been something to remember.

* From the *Popular Science Monthly*.

On Sept. 18 the comet had reached a greater distance from the sun (about 3°, and had become so conspicuous that it was simultaneously rediscovered by a multitude of observers in all parts of the world, and accurate determinations of its position were made at several observatories. On the next day every one had heard of it, and people interested in astronomy thought and talked of nothing else.

On the 19th and 20th the comet was still easily seen by the naked eye. On the 21st it was visible only in places when the air was very clear and the sky darkly blue. On the 22nd a curious observation of it was made at Paris by M. Mallet, who, at the request of M. de Fonvielle, ascended for the purpose in a balloon provided by the latter, thus getting above the clouds with which the city was thickly covered. Of course, it was not possible in this manner to make any precise determination of position, but the aëronaut obtained a fine view of the celestial visitor.

For a few days after this the comet does not appear to have been observed until it had receded far enough from the sun to become visible before sunrise. Then, for awhile, during the early days of October, it was a most magnificent object, with a head at first rivalling Jupiter in brightness, and a tail which, though not of unusual dimensions, never much exceeding 60,000,000 miles, was remarkably well defined, dense, and luminous. It moved slowly toward the south and west, and when, once in a while, a clear morning permitted the view, it was seen to be growing fainter and more diffuse, though not smaller.

To the naked eye or opera-glass it has, perhaps, presented fewer phenomena of interest than some other comets—that of 1858, for instance. It has not exhibited any of the peculiar secondary tails or straight streamers which were so characteristic of that comet, nor has the striation of the tail been marked, though evident enough on close inspection.

From Sept. 27 to Oct. 1, however, the tail was "rifted." There was one obscure streak extending from the nucleus through its whole length, described both by Ricco, of Palermo, and Dr. Hastings, of Baltimore, and the latter mentions another fainter one parallel to the first, and shorter.

On Oct. 2nd the tail, as seen at Princeton, was about 14° long, exceedingly bright and sharp in its outlines, slightly curved and convex to the horizon. It was especially well defined near the head, and almost equally so on both sides. On the 4th the upper edge was veiled and rendered indefinite by a faint nebulosity which appeared to have emanated from the head. Ricco's drawing of it, as seen at this date in the clear Italian sky, shows something resembling a bright comet enveloped in a fainter one; but the smaller one is eccentric, and south of the middle of the hazy envelope.

On the 10th, this external nebulosity had considerably increased. Professor Smith, of Kansas University, noticed on the 9th a pale stream of light with parallel edges, and nearly as wide as the tail of the comet, extending toward the sun. On the 15th, the phenomenon had become much more conspicuous. The streamer was now over half a degree in width, well defined at both edges, of nearly uniform brightness throughout, though nowhere as bright as even the faintest portions of the tail, and extended from its origin, a degree or two above the nucleus, to a distance of two or three degrees below the head, where it faded out. The dotted lines in Fig. 1 (see next page) indicate its form and dimensions.

This streamer, which remained visible only a few days, may have originated in the enveloping comet of Ricco's

figure just spoken of, but no other comet is known to have shown anything of the kind. It is not to be confounded with the sunward jets sometimes ejected by cometary nuclei, nor did it at all resemble the anomalous tail, directed toward the sun, shown by Pechüle's comet (in December, 1880), in addition to its ordinary tail.

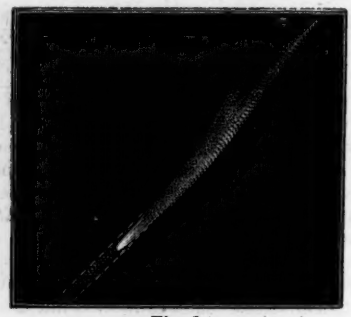


Fig. 1.

On Oct. 9, Schmidt, of Athens, announced the discovery of a small companion comet, 4° south-west of the large one, and moving parallel with it. So far as we know, no one else has observed this companion, though it was carefully looked for at Washington, Princeton, and elsewhere. On Oct. 21, however, Mr. Brooks, of Phelps, New York, observed either the same or another one, some 8° south and east from the large comet. Like Schmidt's companion, it was very faint (though large), and we have seen no observations of it from other sources. We have no means of ascertaining whether these attendants accompanied the comet on its way to the sun as separate objects, or whether they are fragments detached from the main body.

Mr. Brooks seems to think that the nebulous mass observed by him was in some way connected with the faint envelope and streamer just spoken of, which is not unlikely.

(*To be continued.*)

THE CHEMISTRY OF COOKERY.

By W. Mattieu Williams.

LET us now make practical application of the laws of albumen coagulation that were demonstrated in the test-tube experiment. The non-professional student may do this at the breakfast fireside. The apparatus required is a saucepan large enough for boiling a pint of water—the materials, two eggs.

Cook the first in the orthodox manner by keeping it in boiling water three and a half minutes. Then place the second in this same boiling water; but, instead of keeping the saucepan over the fire, place it on the hearth and leave it there, with the egg in it, about ten minutes or more. A still better way of making the comparative experiment is to use, for the second egg, a water-bath, or *bain-marie* of the French scientific cook; a vessel immersed in boiling, or nearly boiling water, like a glue pot, and therefore not quite so hot as its source of heat. In this case a thermometer should be used, and the water surrounding the egg be kept at or near 180° Fahr. Time of immersion about ten minutes or more.

A comparison of results will show that the egg that has been cooked at a temperature of more than 30° below the boiling point of water is tender and delicate, evenly so throughout, no part being hard while another part is semi-raw and slimy.

I said "ten minutes or more," because, when thus cooked, a prolonged exposure to the hot water does no mischief; if the temperature of 160° is not exceeded, it may remain for half-an-hour; in fact, the perfection of cooking, according to my experience (I always cook my own eggs when I have the opportunity and can spare the time), is attained when kept at 160° about twenty minutes. The 180° is above-named because the rising of the temperature of the egg itself is due to the difference between its own temperature and that of the water, and when that difference is very small, this takes place very slowly, besides which the temperature of the water is, of course, lowered in raising that of the cold egg.

In order to test this principle severely, I have just made the following experiment. At 10.30 p.m. I placed a new-laid egg in a covered stoneware jar, of about one pint capacity, and filled this with boiling water; then wrapped the jar in many folds of flannel—so many that, with the egg, they filled a hat-case in which I placed the bundle—and left it there until breakfast-time next morning, ten hours later. On unrolling, I found the water cooled down to 95°, that the yolk of the egg was hard, but the white only just solidified and much softer than the yolk. On repeating the experiment, and leaving the egg in its flannel coating for four hours, the temperature of the water was 123°, and the egg in similar condition—the white cooked in perfection, delicately tender, but the yolk too hard. A third experiment of twelve hours, water at 200° on starting, gave similar result as regards the state of the egg.

This brings out a fact hitherto unknown to either cooks or chemists, viz., that the yolk coagulates firmly at a lower temperature than the white. Whether this is due to a different condition of the albumen itself or the action of the other constituents on the albumen, requires further research to determine.

When eggs are cooked in the ordinary way, the 3½ minutes' immersion is insufficient to allow the heat to pass fully to the middle of the egg, and therefore the white is subjected to a higher temperature than the yolk. In my experiment there was time for a practically uniform diffusion of the heat throughout.

I shall describe hereafter what is called the "Norwegian" cooking apparatus, wherein fowls, &c., are cooked as the eggs were in my hat-case.

Albumen exists in flesh as one of its juices, rather than in a definitely-organised condition. It is distributed between the fibres of the lean (*i.e.*, the muscles), and it lubricates the tissues generally, besides being an important constituent of the blood itself—of that portion of the blood which remains liquid when the blood is dead, *i.e.*, the serum. As blood is not an ordinary article of food, excepting in the form of "black puddings," its albumen need not be here considered, nor the debated question of whether its albumen is identical with the albumen of the flesh.

Existing thus in a liquid state in our ordinary flesh meats, it is liable to be wasted in the course of cookery, especially if the cook has only received the customary technical education and remains in technological ignorance.

To illustrate this, let us suppose that a leg of mutton, a slice of cod, or a piece of salmon is to be cooked in water, "boiled," as the cook says. Keeping in mind the results of the previously-described experiments on the egg-albumen, and also the fact that in its liquid state albumen is diffusible in water, the reader may now stand as scientific umpire in answering the question whether the fish or the flesh should be put in hot water at once, or in cold water,

and be gradually heated. The "big-endians" and the "little endians" of Lilliput were not more definitely divided than are certain cookery authorities on this question in reference to fish. I refer to the two which are practically consulted in my own household, that by Mrs. Beeton, and some sheet tablets hanging in the kitchen. Mrs. Beeton says pour cold water on the fish, the tablets say immerse in hot water.

Confining our attention at present to the albumen, what must happen if the fish or flesh is put in cold water, which is gradually heated? Obviously a loss of albumen by exudation and diffusion through the water, especially in the case of sliced fish or of meat exposing much surface of fibres cut across. It is also evident that such loss of albumen will be shown by its coagulation when the water is sufficiently heated.

Practical readers will at once recognise in the "scum" which rises to the surface of the boiling water, and in the milkiness that is more or less diffused throughout it, the evidence of such loss of albumen. This loss indicates the desirability of plunging the fish or flesh at once into water hot enough to immediately coagulate the superficial albumen, and thereby plug the pores through which the inner albuminous juice otherwise exudes.

But this is not all. There are other juices besides the albumen, and these are the most important of the *flavouring* constituents, and, *with the other constituents of animal food*, have great nutritive value; so much so, that animal food is quite tasteless and almost worthless without them. I have laid especial emphasis on the above qualification, lest the reader should be led into an error originated by the bone-soup committee of the French Academy, and propagated widely by Liebig—that of regarding these juices as a concentrated nutriment when taken alone.

They constitute collectively the *extractum carnis*, which, with the addition of more or less of gelatine (the less the better), is commonly sold as Liebig's "Extract of Meat." It is prepared by simply mincing lean meat, exposing it to the action of cold water, and then evaporating down the solution of extract thus obtained.

I shall return to this on reaching the subjects of clear soups and beef-tea, at present merely adding, as evidence of the importance of retaining these juices in cooked meat, that the extracts of beef, mutton, and pork may be distinguished by their specific flavours. Some Extract of Kangaroo, sent to me many years ago from Australia by the Ramornie Company, made a soup that was curiously different in flavour from the other extract similarly prepared by the same company. Epicures pronounced it very choice and "gamey." When these juices are removed from the meat, mutton, beef, pork, &c., the remaining solids are all alike, so far as the palate alone can distinguish.

Let us now apply these principles practically to the case of a leg of mutton. First, in order to seal the pores, the meat should be put into boiling water; the water should be kept boiling for five or ten minutes. A coating of firmly-coagulated albumen will thus envelope the joint. Now, instead of boiling or "simmering" the water, set the saucepan aside, where the water will retain a temperature of about 180°, or 32° below the boiling-point. Continue this about half as long again, or double the usual time given in the cookery-books for boiling a leg of mutton, and try the effect. It will be analogous to that of the egg cooked on the same principles, and appreciated accordingly.

The usual addition of salt to the water is very desirable. It has a three-fold action: first, it directly acts on the superficial albumen with coagulating effect; second, it slightly raises the boiling point of the water; and third, by increasing the density of the water, the "exosmosis" or oozing out of the juices is less active. These actions are slight, but all co-operate in keeping in the juices.

I should add that a leg of mutton for boiling should be fresh, and not "hung" as for roasting. The reasons for this hereafter. Fish "to follow" in my next.

THE BIRTH AND GROWTH OF MYTH.

IV.

BY EDWARD CLODD.

MANIFOLD are the phases of Nature; manifold is the life of man; and we must not lend a too willing ear to theories which refer the crude explanations of an unscientific age, when the whole universe is Wonderland, to one source. *Cave ab homine unius libri*, says the adage, and we may apply it, not only to the man of one book, but also to the man of one idea, in whom the sense of proportion is lacking, and who sees only that for which he looks. Here such caution is introduced as needful of exercise towards the comparative mythologists who, not content with showing—as abundant evidence warrants—that myth has its germs in the investment of the powers of nature with personal life and consciousness, contend that the great epics of our own and kindred races are, from their broadest features to minute detail, but nature-myths obscured and transformed.

Certain scholars, notably Sir G. W. Cox and Professor de Gubernatis, as interpreters of the myths of the Indo-European peoples, and Dr. Goldziher, as an interpreter of Hebrew myth and cognate forms, maintain that the names given in the mythopœic age to the sun, the moon, and the changing scenery of the heaven as the myriad shades and fleeting forms passed over its face, lost their original signification wholly or partially, and came to be regarded as the names of veritable deities and men, whose actions and adventures are the disguised descriptions of the sweep of the thunder-charged clouds and of the victory of the hero-god over their light-engulfing forces. But it is better to state the theory in the words of its exponents, and for that purpose a couple of extracts from Sir George Cox's "Mythology of the Aryan Nations" will suffice.

"In the spontaneous utterances of thoughts awakened by outward phenomena, we have the source of myths which must be regarded as *primary*. But it is obvious that such myths would be produced only so long as the words employed were used in their original meaning. If once the meaning of the word were either in part or wholly forgotten, the creation of a new personality under this name would become inevitable, and the change would be rendered both more certain and more rapid by the very wealth of words which were lavished on the sights and objects which most impressed their imagination. A thousand phrases would be used to describe the action of a beneficent or consuming sun, of the gentle or awful night, of the playful or furious wind; and every word or phrase become the germ of a new story as soon as the mind lost its hold on the original force of the name. Thus, in the polyonymy" (by which term Sir Geo. Cox means the giving of several names to one object) "which was the result of the earliest form of human thought we have the germ of the great epics of later times, and of the countless legends which make up the rich stores of mythical tradition. . . . . and the legends so framed constitute the class of *secondary* myths" (p. 42).

"Henceforth the words which had denoted the sun and moon would denote not merely living things but living persons. . . . Every word would become an attribute, and all ideas, once grouped round a single object, would branch off into distinct personifications. The sun had been the lord of light, the driver of the chariot of the day; he had toiled and laboured for the sons of men, and sunk down to rest, after a hard battle, in the evening. But now the lord of light would be Phoibos Apollôn, while Helios would remain enthroned in his fiery chariot, and his toils and labours and death-struggles would be transferred to Herakles. The violet clouds which greet his rising and his setting would now be represented by herds of cows which

feed in earthly pastures. There would be other expressions which would still remain as floating phrases, not attached to any definite deities. These would gradually be converted into incidents in the life of heroes, and be woven at length into systematic variations. Finally, these gods and heroes, and the incidents of their mythical career, would receive each 'a local habitation and a name.' These would remain as genuine history when the origin and meaning of the words had been either wholly or in part forgotten" (p. 51).

Such is the "solar myth" theory, the general principles of which are sound enough, but the unqualified application of which has caused recoil in many minds inclined to its acceptance. "We can hardly," as Mr. Matthew Arnold says, "now look up at the sun without having the sensations of a myth," and if occasion has not been given to the adversary to blaspheme, he has been supplied with ample material for banter and ridicule. Some of the happiest illustrations of this are made by Mr. Foster in his amusing and really informing essay on "Nature Myths in Nursery Rhymes," reprinted in "Leisure Studies," an essay which it seems the immaculate critics took *au sérieux!* With a little exercise of one's invention, given also ability to parody, it will be found that many noted events, as well as the lives of the chief actors in them, yield results comforting to the solar mythologists. Not only the Volsungs and the Iliad, but the story of the Crusades and of the conquest of Mexico; not only Arthur and Baldr, but Cæsar and Bonaparte, may be readily resolved, as Professor Tyndall says we all shall be, "like streaks of morning cloud, into the infinite azure of the past." Dupuis, in his researches into the connection between astronomy and mythology, had suggested that Jesus was the sun, and the twelve apostles the zodiacal signs; and Goldziher, analysing the records of a remote period, maintains the same concerning Jacob and his twelve sons. M. Senart has satisfied himself that Gautama the Buddha, is a sun-myth. Archbishop Whately, to confound the sceptics, ingeniously disproved the existence of Bonaparte; and a French ecclesiastic has by witty etymological analogies shown that Napoleon is cognate with Apollo, the sun, and his mother Letitia identical with Leto, the mother of Apollo; that his *personnel* of twelve Marshals were the signs of the zodiac, his retreat from Moscow a fiery setting, and his emergence from Elba, to rule for twelve years, and then be banished to St. Helena, the sun rising out of the eastern waters, to set in the western ocean after twelve hours' reign in the sky. But upon this solar theory, let us cite what Dr. Tylor, whose soberness of judgment renders him a valuable guide along the zigzag path of human progress, says:—"The close and deep analogies between the life of nature and the life of man have been for ages dwelt upon by poets and philosophers, who, in simile or in argument, have told of light and darkness, of calm and tempest, of birth, growth, change, decay, dissolution, renewal. But no one-sided interpretation can be permitted to absorb into a single theory such endless many-sided correspondences as these. Rash inferences which, on the strength of mere resemblance, derive episodes of myth from episodes of nature, must be regarded with utter mistrust, for the student who has no more stringent criterion than this for his myths of sun and sky and dawn, will find them wherever it pleases him to seek them."

The investigations of comparative mythologists, more particularly in this country and Germany, have thrown such valuable light on the history of civilisation that it will be instructive to learn what excited the inquiry, on what facts the solar theory rests, and what other facts its supporters overlook.

The researches of Niebuhr and his school into the credibility of early history made manifest that the only authority on which the chroniclers relied was tradition. To them — children of an uncritical age — that tradition was venerable with the lapse of time, and binding as a revelation from the gods. To us the charm and interest of it lie in detecting within it the ancient deposit of a mythopœic period, and in deciphering from it what manner of men they must have been among whom such explanation of the beginnings had credence. And in such an inquiry nothing can be "common or unclean," nothing too trivial or puerile for analysis; for where the most grotesque and impossible are found, there we are nearer to the conditions of which we would know more.

The serious endeavour to get at the fact underlying the fabulous was extended to the great body of mythology which had not been incorporated into history, and the interpretations of which satisfied only those who suggested them. As hinted already, the Greeks had sought out the meaning of their myths, with here and there a glimpse of the truth gained; but this was confined to the philosophers and poets. Euhêmeros degraded them into dull chronicle, making Herakles a thief who carried off a crop of oranges; Jove a king crushing rebellion; Atlas an astronomer; Python a freebooter; Æolus a weather-wise seaman, and so on. Plutarch tried to "restore" them, but only defaced them, and after centuries of neglect they were discovered by Lord Bacon to be allegories with a moral. Then Banier and Lempriere emptied out of them what little life Euhêmeros had left, and the believers in Hebrew as the original speech of mankind saw in them the fragments of a universal primitive revelation! Even the distinguished scholar, Professor Max Müller, is so upset by the many loathsome and revolting stories in a mythology current in the land of Lykurgos and Solon, that he can account for them only by assuming "a period of temporary insanity through which the human mind had to pass," and a degradation from lovely metaphor to coarse fact which only a "disease of language" explains. There is, however, no need for assumptions of this or of any other kind, for language itself reveals the origin of myth, and shows it to be in keeping with all that is elsewhere established concerning primitive modes of thinking.

BICYCLES AND TRICYCLES IN 1883.

By John Browning,

Chairman and Treasurer of the London Tricycle Club.

WHEN referring to bicycles in my previous articles, I intended to mention the "Facile," and I now gladly repair the omission.

The machine may be considered fairly safe; it is a good hill-climber, and the wonderful records made in the late Bath-road ride, when Mr. Walter Snook rode 215 miles in twenty-four hours, prove the "Facile" to be one of the best long-distance roadsters made.

A scientific friend, who has for a long time ridden a tricycle, consulted me some months ago respecting a bicycle. I recommended the "Facile," and a few days since he told me that he was so pleased with the machine that he contemplated giving up his tricycle altogether, in favour of the "Facile." The "Special Facile" has ball-bearings to all motions; both this and the ordinary machine might easily be made to weigh a few pounds less with advantage.

Having, in my previous article, said so much about a rear-steering tricycle, the "Sterling," I must devote the rest of my space in this paper to front-steering machines.

XUM

Starley's best invention, the "Salvo," was the model on which all the most improved machines we have of this type were based. Last season the model itself had fallen behind the times; but this year I am pleased to say that both the details of construction and the workmanship have been greatly improved, and the "Salvo" is one of the best and soundest tricycles for all-round work made.

The front-steering machines of the same class are the "Premier," by Hillman, Herbert, & Cooper; the "Imperial Club," by the Coventry Machinists' Co.; the "Apollo," by Singer & Co.; and the "Fleet," by Little; of these, I should give the preference to the "Imperial Club," but there is, in truth, but little difference between them; all are graceful in form, and as light as they can well be made, consistent with strength, and of excellent workmanship. The new "Weston" front-steerer is worth attention for its novel light frame, and double driving arrangement, and its good work. Though made in London it is low in price.

One of the most novel and yet simplest machines introduced this season is the "Greyhound." This is a front steerer, with bicycle steering action. It is light, and very well made, and, considering the good quality of the work, it is the cheapest machine I have seen. The only fault I can find with it is that it is difficult to mount and dismount; but some addition in the way of a step will obviate this fault.

The "Diana" is a new front-steering machine introduced this season by the St. George's Foundry Co. It has a totally new double-driving arrangement and two speeds. Both of these are obtained by an application of steel balls about the size of very large peas, clutched on to steel wire cord. These enable both cog-wheels and chains to be entirely dispensed with. The same makers have brought out a double or sociable front-steerer, named the "Europa." Both these machines should have smaller wheels and rather lighter frames, and they would probably then come into the front rank, if the ball-gear stands the test of wear.

Many machines have been introduced this season capable of being driven at *two speeds*. Of the various contrivances for effecting this great desideratum I unhesitatingly give the preference to Britten's, which is free from complication, efficient, very light, adding at the utmost only two or three pounds to the weight of the machine, and can be made at a lower price than any other I have seen. The inventors of several of these contrivances talk of charging from £6 to £10 for them, while Britten's arrangement will probably be applied to a machine for fifty, or at the utmost sixty, shillings.

A good two-speed gear would be invaluable as an addition to sociable, or, in other words, double tricycles, and will possibly be adopted on all machines except the very lightest front-steerers. From numerous experiments I have made during the last two years in gearing I have come to the conclusion that the best proportion is about 15 inches difference between the low and high speeds. Thus, a machine which has a high speed of 48 in. inches, should have a low speed of 33 in., or a high speed of 45 in. should have a low speed of 30 in. This last will be found the best arrangement for the majority of riders. The machine should always be so contrived that when the two-speed arrangement is thrown completely out of gear the pedals are free to be used as foot-rests when running down hill.

INTERNATIONAL SCIENTIFIC SERIES.—NOTICE.—The New Volume in the above Series, entitled ELEMENTARY METEOROLOGY, by ROBERT H. SCOTT, Secretary to the Meteorological Council, is Now Ready, with Numerous Illustrations, crown 8vo, cloth, price 5s.

London: KEGAN PAUL, TRENCH, & CO.

BIRDS IN COLD WEATHER.

M. F. LESCUYER has published some interesting observations concerning the power that was shown by the birds of his district of the valley of the Marne, France, for resisting the severe cold of the winter of 1879-80. The sparrows, finding shelter and food around the houses, passed the season fairly well, but some of them perished in the roads and gardens; they became more scarce toward the end of the winter, and lost all their liveliness. The partridges gave way under sixty-one days of cold and hunger, and those that survived fell an easy prey to the hawks. A private watchman caught more than thirty with his hands, warmed them up, and let them loose again. The owls in the lofts and steeples could not resist the cold, and fell dead to the ground, or took refuge in the houses, where they were captured. The stomachs of all these birds were empty or nearly empty. The crows, which range over a larger extent of land than the former birds, which may be called sedentary birds, came nearer to the houses when the cold was at its worst, and considerable numbers of them were seen during the whole winter in the barn-yards and fields. Some of them came into the court-yards to eat with the pigeons, but many were frozen to death on the limbs where they roosted. The few birds of passage that stayed in the country to winter showed very unequal powers of resistance. The bullfinches and grossbeaks did not seem to suffer, but the larks, yellow-hammers, greenfinches, robin-redbreasts, magpies, blackbirds, and jays were decimated. Never were so few birds seen in the woods at that season as in the following spring. Birds of passage, coming from the north to seek a milder climate in France, were disappointed. Domestic birds would have suffered greatly but for the shelter and feeding they enjoyed; fowls were worse affected than web-footed birds. The winter to which these observations relate was one of the severest ever experienced in France, and was very much like a North American northern winter.

THE LIBRARIES OF BABYLONIA AND ASSYRIA.

II.

ERECH, the modern Warka, is a city at which we know there must have been one or more libraries, for it was from thence Assurbannipal copied the famous Isdubar series of legends in twelve tablets, one of which contained the account of the Deluge. Hence also came the wonderful work on magic in more than one hundred tablets; for, as we have it, it is nothing more than a facsimile by Assurbannipal's scribes of a treatise which had formed part of the collection of the school of the priests at Erech. It was divided into three parts, the first of which was entitled "The Evil Spirits," for that is the catch, or index phrase, on each of its tablets. So long a time had elapsed since the work was first written out in the two ancient dialects at Erech, that the Babylonian (or Accadian) portions of some of the hymns was lost, and the Assyrian translation only is given, but the style of this is so different, the syntax so contrary to ordinary Assyrian documents, also the number of pure Accadian words interspersed so numerous, that it is easy to recognise the influence of the original dialect, in which they were embodied, upon it. With the apparent exception of these few hymns, the whole work is bilingual—that is to

say, written in Accadian, with Assyrian translations either below or by its side, proving that the knowledge of the former had, even at the early time at which they were compiled, died out except among the learned. For we know that the second or Assyrian version was in the original texts and not merely introduced in Assurbannipal's time, not only from the incidental evidence just cited, but by notes of the scribes on the tablets themselves; for instance, some have a postscript, as follows:—"Conformably with the ancient tablets and documents of instruction of Assur and Accad in parallel columns," or, "According to the tablet in parallel columns of Babylon." "This great work on magic," says Lenormant, "consisted of formulæ of conjuration and imprecation, designed to repulse demons and other wicked spirits and avert their action and to shelter the invoker from their attacks; also incantations to which were attributed the power of curing various maladies. Lastly, the third book contained hymns to certain gods. A supernatural and mysterious power was attributed to the chanting of these, which were, however, very different to the regular liturgical prayers of the official religion."

The translation of a beautiful hymn to Ishtar is given by Mr. Sayce,* from a text which is a copy of one in an Erech library, and, as with all such tablets in Assurbannipal's collection, has a statement at the end commencing thus:—"Like its original written and translated palace of Assurbannipal, King of Assyria." Most of its Accadian and Assyrian originals appear to have come from Erech, a Babylonian city which, when all else revolted, had remained faithful to Assurbannipal, and to which he gave back an image of a goddess which had been taken away by the Elamites sixteen centuries before. The British Museum possesses over fifty contract tablets from Erech of the Assyrian and Persian period, and one text relating to repairs to a temple of the time of Demetrius.

Larsa, now named Senkereh, was the seat of a tablet collection that seems to have been largely a mathematical one; for in the remains we possess of it are tablets containing tables of squares and cube roots and others, giving the characters for fractions. There are from here also, however, fragments with lists of the gods, a portion of a geographical dictionary, lists of temples, &c. Mr. Loftus brought from Senkereh a number of triangular contract tablets with holes at the angles, through which cords were probably passed to secure parchment or some other material to them. Another tablet exhumed from this site by the same explorer has been found to be a copy of one given in the Cuneiform Inscriptions published by the British Museum from an Assyrian text. The Larsa copy is considered to be at least 1,000 years older than the Assyrian duplicate. Such an instance as this will give some idea of the great antiquity of the originals of tablets in Assyrian collections; for doubtless the first version of the text was very ancient when copied for the Larsa library. This city is also famous for having presented us with variant copies of a cylinder of Nebuchadnezzar. In the "Early History of Babylonia," Mr. Smith translates two inscriptions of Sin Iddina from Larsa, and it is from this city that some of the earliest contract tablets are derived. To a library at Cutha we owe the remnants of a tablet work containing an account of the creation and the wars of the gods, and, among others, a very ancient terra-cotta tablet bearing a copy of an inscription engraved in the temple of the god Dup Lan at Cutha, by Dungi, King of Ur.

The number of tablets and cylinders found by M. de Sarzec at Zirgulla show that there too the habit of committing so much to writing was as rife as in other cities of whose literary character we know more, because Assyrian copyists state of them distinctly, that from thence the originals of many of their documents are derived. Zirgulla, however, is peculiar in respect to its scribes having apparently preferred to engrave their texts upon cones, which are very numerous at this site, and the British Museum now has a fine collection of them.

A Member of the Society of Biblical Archæology.

* "Records of the Past," v. 135.

LOGICAL PUZZLE.

By Richard A. Proctor.

THE logical puzzle has brought in some curious evidence of puzzledom, especially in the amazingly incorrect applications of the syllogism (if so it can be called). It may be remembered that my original remark respecting it was that it should be obvious; and that every example of the application of the syllogism should be at once dealt with correctly by ordinary common sense. But I find so many suggested examples, which are not applications of the syllogism, that I begin to think with De Morgan, that it must be really difficult to many.

Let me endeavour to do what is not always easy—let me try to show how, at the first hearing, the syllogism appears obvious to a clearly reasoning mind. It runs thus:—(1) For every Z there is an X which is not Y; (2) Some Y's are Z's; $\therefore$ (3) Some X's are not Z's.

When statements (1 and 2) have been heard, the mind immediately pictures a set of X's equal in number to the Z's, and also pictures the Z's divided into two sets, those which are Y's and those which are not Y's; thus

$$\begin{array}{l|l} XXXX \ldots\ldots XX & XXXX \ldots\ldots\ldots\ldots XXXX \\ ZZZZ \ldots\ldots ZZ & ZZZZ \ldots\ldots\ldots\ldots ZZZZ \end{array}$$

(the Z's which are to the right of the line are Y's, and the line may fall anywhere to the left of the last Z, for aught statement 2 tells us.) Is not this enough? There are all those X's, and possibly more; there are those Z's, and no more. *Only the Z's to the left of the line* are not Y's, and *all* the X's shown are not Y's. So there are clearly more X's than there are Z's of the kind which *can* be X's of the set shown; some of these X's, then, cannot be Z's.

I say the mind pictures this, meaning that in an instant this sort of separation is as it were discerned; and I cannot, for my own part, conceive any mind which has once taken in the meaning of the first two statements, hesitating for a moment either in admitting, or in seeing for itself without being told, that some of the X's cannot be Z's.

Apart from any picturing, the reasoning runs somewhat like this:—

The not-Y X's being as numerous as *all* the Z's are more numerous than the not-Y Z's (for *some* Z's are Y's); since, then the not-Y Z's can only a match *a certain number* of the not-Y X's, and not *all*, the balance of not-Y X's, not to be matched by any Z's, are not Z's. More X's may not be Z's; but *so many* are *certainly* not Z's.

As for any use this syllogism has—like the syllogisms proper, it is barren. Among the tens of thousands of readers of Knowledge, can one quote a case where either a truth has been discerned, or an error avoided, by the application of this syllogism?

Oddly enough, the greater number of those who have tried to give examples of this syllogism, make either the major or minor premiss inconsistent either with the possible correctness of the conclusion, or with the conclu-

sion being anything but correct. To start with any premiss in which the X's are not of the same general order as the Z's must inevitably make the conclusion (following the terms of the syllogism) a necessity; while starting with any premisses in which the X's are of necessity Zs, must as manifestly lead to absurdity.

Thus if we begin—

1. For every man (Z) there is a house (X) which is not an animal (Y),

We must not be greatly surprised if, continuing,

2. Some animals are men,

We arrive at the presumably correct result that

$\therefore$ Some houses are not men.

For those who like such puzzles, here is another, which also should not need a moment's consideration after the premisses are properly grasped :—

1. For every Z there is an X, which is Y.
2. Some Z's are not X's.

$\therefore$ Some Y's are not Z's.

Here, as in the other, the reasoning is simple, almost instinctive. 1. Tells us there are *as many* X's which are Y's as there are Z's, and therefore, (from 2), *more* X's which are Y's, than there are Z's which are X's. For *some* of these XY's, then, there are no Z's: *i.e.*, some Y's are not Z's.

Here is a simpler one :—

There are a thousand Z's; 800 X's are Z's; 300 Y's are Z's; therefore, at least 100 X's are Y's.

Professor Perry stated at a meeting of the Society of Telegraph Engineers, yesterday week, that the Edison Company of New York regard the electricity supplied by them for illuminating purposes as almost a waste product, inasmuch as their generators are far more profitably employed in the production of electricity for manufacturing purposes. In other words, it pays them better to supply power than light.

The Governmental *North German Gazette* refers reproachfully to the fact that the North German Lloyd Company has ordered from a well-known Clyde firm a couple of steamers, each of 2,500 tons burden and 6,000-horse power. Such conduct, it suggests, is both unpatriotic and anti-protectionist—two very heinous faults in the eyes of the German Chancellor and his accredited organs.

The total number of houses inspected by the officers of the Sanitary Protection Association during the year 1882 was 362. Of these 21, or 6 per cent., were found to have their drains entirely choked up, and no communication whatever with the sewer; all the foul matter sent down the sinks and soil-pipes simply soaking into the ground under the basement of the houses. In 117 houses, or 32 per cent., the soil-pipes were found to be leaky, allowing sewer-gas, and in many cases liquid sewage, to escape into the house. In 137, or 37 per cent., the overflow pipes from the cistern were led direct into the drains or soil pipes, allowing sewer gas to pass up them, and contaminate the water in the cisterns, and in most cases to pass freely into the house. In 263, or nearly three-fourths of the houses inspected, the waste-pipes from baths and sinks were found to be led direct into the drain or soil-pipes, thus allowing the possibility of sewer gas passing up them instead of being led outside the house, and made to discharge over trapped gullies in the open air, as they should be.

Reviews.

SNAKES.*

Miss Hopley, in her introduction to the work before us, quotes a noteworthy statement by Mr. E. Newman, first editor of the *Zoologist*, to the effect that "the attempt to combine scientific truths with readable English was considered by his friends" exactly half a century ago "one of surpassing rashness;" he had many "solicitations to desist from so hopeless a task," many "supplications to introduce a few Latin descriptions to give it a scientific character." Miss Hopley has attempted—and what is more, has achieved—a task regarded now as much more unusual. Even the "flatfeet" of science no longer consider it necessary to use long technical words lest the dignity of science should suffer; or if they do, they quickly learn that the general public is too intelligent to put up with such nonsense. But there is still a widely-spread feeling that to make scientific work attractive by narrative and gossip is an unsafe experiment, and that the chatty and tale-telling books about science are mostly full of errors. Now the science of Miss Hopley's book is not only sound in the main, but corrects many common and widely-spread errors which have been again and again repeated in professedly scientific text-books of zoology. Yet the book is as amusing as a novel—we should rather say as a good novel, for our railway bookstalls teach us that the really readable novels form but a small percentage of the total number. Of course, the accuracy of Miss Hopley's book is chiefly due to her study of the best authorities; she has not herself been able to test or observe a tithe of the facts she here presents. But that was unavoidable. For the brightness of the book, and the store of well-placed narratives, we have to thank Miss Hopley only. And it is worthy of notice that she deserves thanks in the name of science, seeing that whatever attracts readers to the study of a scientific subject (while legitimately appertaining to its discussion) does good service. A dry list of facts, qualities, dimensions, and so forth, occupies less space, and is for reference more convenient; but it is certainly not likely to attract new recruits to the study of a science.

Snakes may appear a strange subject of study for a lady, though there are few creatures more graceful, more beautiful, and more innocent than the greater number of these much-hated creatures. Among birds, which are considered specially suited for feminine study, there is not greater grace of motion, there are not more beautiful combinations of colour, and if some snakes are repulsive and hideous, they are not more so than the vulture or the carrion crow. Yet snakes have had a bad character from time immemorial. If they have been worshipped, it has been through fear and hate, rather than for any good qualities they have been supposed to possess. As the dove has been associated with the Spirit of Good, so the serpent has been regarded as a fit, if not the natural, abode of the Spirit of Evil: (not that the narrative in Genesis gives anywhere authority for Milton's theory on this subject.) Because the serpent was more subtle than any beast of the field, he suggested (B.C. 4004) to our first feminine parent ("to suit his private ends,") that she should eat of the fruit of the Tree of Knowledge. The result proved unfortunate for all parties concerned; but in a scientific sense we are chiefly interested in the statement that from that time forth, or

* "Snakes: Curiosities, and Wonders of Serpent Life." By Catherine C. Hopley. (Griffith & Farren, London.)

now for nearly 6,000 years, the serpent has had to go upon his belly and to eat dust all the days of his life. Professor Owen, indeed, affirms that, so far from the reptiles being degraded from a higher type, their whole organisation demonstrates how exquisitely their parts are adapted to their necessities. "They can outclimb the monkey, outswim the fish, outleap the jerboa, and, suddenly loosing the coils of their crouching spiral, they can spring into the air, and seize the bird upon its wing;" but perhaps the original serpent expected as much, and acted accordingly, being "more subtle than any beast of the field."

Certainly no one who carefully studies the work before us can question the wonderful adaptation of the structure of every kind of serpent to its mode of life, and especially to its powers of attack, defence, and escape from its foes. The living creatures on which the serpents of various orders prey might reasonably object to the provision apparently made for the serpent's success; as might creatures which like to feed on serpents object to the difficulty of catching them. Yet a fair balance enough is struck. The same bountiful Mother Nature which furnished the serpent with his wonderful powers, either makes the animals which form his natural prey active enough to have a fair chance of escape, or provides them so superabundantly that enough survive to keep up and even to improve the stock. And serpents get caught too, clever though they are. Nay, serpents prey on each other. The Racer, for instance, makes short work of the Rattlesnake, catching that objectionable creature deftly, holding one part of it in one coil, another in another coil, and then, by an instantaneous extension, snapping the poor dear *Crotalus* in half, as a seamstress snaps a thread after twisting it round a finger of each hand.

Miss Hopley combats the common errors about snakes. But surely she a little exaggerates their prevalence. *Do* most people suppose that snakes sting? Shakespeare *may*, as Miss Hopley suggests, have had the Bible devoutly in his mind when he talked of the adder's "sting," or, without particular devotion, may have been (most probably was) altogether ignorant of the fact that adders no more sting than serpents "make sharp their tongues," or than "the viper's tongue" is slaughterous, as the writer of the Book of Job (xx., 16) supposed. But surely in these days nearly everyone knows enough about snakes to reject the tongue-stinging mistake, though they may not be aware how utterly incorrect is the common text-book description of the poison fang (even Miss Buckland, in her "Winners in Life's Race," leaves this error uncorrected). Nor had we known that many suppose all snakes to lick their victims over and smear them with saliva before eating them. Miss Hopley notes, by-the-way, that ten years ago the editors of magazines refused to put snakes in their pages; but nearly half-a-century ago the *Penny Magazine* had some really awful snakes in, without frightening its readers. To say nothing of the impossible snakes attacking Laocoon & Sons, there was a monstrous boa constrictor certainly not less than a hundred feet long, another constrictor opening its mouth very widely for a rabbit, a snake fascinating a bird, and so forth. A member of a publishing house told Miss Hopley that his mother feared he would be prevented from sleeping, when a child, if he looked at snake pictures. But so far as we remember none of these pictures prevented our sleeping.

The whole book is thoroughly enjoyable and trustworthy, —outside the travellers' tales, some of which only a boa constrictor could absorb. The illustrations are good, and many of them are new. Occasionally, the construction of sentences is open to exception. It is not quite correct to speak of "secondly, a number of harmless snakes, of which those at the Gardens are among the latter"; but perhaps the compositor was in fault here (there is a "them" for "those" in KNOWLEDGE, Vol. III. p. 86, l. 15 from bottom of col. 2, which must have made Mr. Proctor's hair stand on end). Again, to speak of two ladies as "editresses of that *facile princeps* among juvenile periodicals," &c., is not strictly correct. Miss Hopley is probably joking when she speaks of a keeper enjoying "the high honour of taking snakes out of their cages to place them in royal hands"; it is an unusual privilege, no doubt, but not more so than the kick imparted by Napoleon I. to an unwieldy admirer: unless meant as a joke, the passage is rather out of place anywhere except in the *Court Circular*, where it would come in nicely. But these are very trifling blemishes.

A very interesting section of the book is given to the sea-serpent, which should be carefully studied by those who imagine that all sea-serpent stories are either monstrous yarns or relate to preposterous illusions.

THE FACE OF THE SKY.

FROM MARCH 2 TO MARCH 16.

BY F.R.A.S.

THE student will, as heretofore, examine the sun on every clear day for spots, faculæ, and other indications of disturbance. He should also look carefully for the Zodiacal light (as recommended on p. 105) on every cloudless evening. The major part of the constellations (as enumerated on the page just referred to) continue visible in the night sky; but Aries is now setting in W.N.W., and Hercules and Corona rising in the N.E. and E.N.E. respectively. *a* Cygni will be found close to the horizon, just to the W. of N., and Vega nearer still; just to the E. of it. Crater is appearing, too, above the S.E. by E. horizon. Reference may be made to Map III. of "The Stars in their Seasons" for a picture of the celestial vault at the present season. Mercury and Venus are both indifferently placed for the observer. Mars is invisible, and Jupiter is now approaching the West pretty rapidly. He is still, though, the most brilliant and conspicuous object in the night sky. He describes a short arc from W. to E., above ζ Tauri, during the next fourteen days. The visible phenomena of his satellites are now becoming less frequent and numerous. Satellite III. will be occulted at midnight to-night; and Satellite II. begins its transit over Jupiter's disc at 11.33 p.m. on the 4th. The 6th, should the sky be clear, will provide the young observer with an interesting series of phenomena. At 7 h. 15 m., the shadow of Satellite III. will enter on to Jupiter's face. The transit of Satellite I. will begin at 8 h. 30 m., followed by that of its shadow at 9 h. 48 m. At 10 h. 8 m. p.m., the shadow of Satellite III. will pass off; as will Satellite I. at 10 h. 46 m. Satellite II. will reappear from eclipse at 11 h. 31 m. 24 s.; and finally, the shadow of the first Satellite will leave Jupiter's disc four minutes after midnight. The shadow of Satellite IV. passing on to the face of the planet in the twilight, at 6 h. 33 m. p.m., on the 10th, may be seen to leave it later at 7 h. 35 m. The evening and night of the 13th will again supply the observer with the telescope with plenty of work. Satellite III. enters on to Jupiter's face in bright twilight, and may be seen to leave it at 8 h. 47 m. This should be carefully watched, inasmuch as this Satellite has been seen to cross Jupiter's face as a dark, instead of a bright, spot—resembling its own shadow. Then II. will be occulted at 8 h. 48 m.; and I. begins its transit at 10 h. 24 m. The shadow of Satellite III. will come on to the planet at 11 h. 15 m. (2 hours and 28 minutes after the Satellite casting it has quitted Jupiter's opposite limb!). The shadow of Satellite I. will enter at 11 h. 43 m., the egress of the Satellite itself happening 40 minutes after midnight. On the 14th, Satellite I. will be occulted at 7 h. 39 m., and reappear from eclipse at 11 h. 11 m. 46 s. p.m. Lastly, on the 15th, the ingress of this same Satellite will begin at 7 h. 9 m., and that of its shadow at 8 h. 28 m., the shadow of the second Satellite passing off at 8 h. 50 m. Saturn must be looked at now, as soon as ever it is dark enough, as he is leaving us for the season. He is still situated to the S.E. of δ Arietis. Uranus may be found over 89 Leonis. The Moon does not rise until 2 h. 38 m. to-morrow morning, so that, for our present purpose, she may be said to be invisible until about the 11th, at which date she sets about 9 h. 30 m. p.m. Her age at noon on that day is 2·3 days; whence it is obvious that it will be 3·3 days at the same hour on the 12th, and so on until it is 7·3 days at

mid-day on the 16th. She travels from Pisces into Aries on the 11th, crosses this constellation into Taurus on the 12th, remains in that constellation during the whole of the 13th and 14th, continues her course across Taurus on the 15th, travelling across the north-eastern part of Orion, and so into Gemini, where we leave her at the civil noon of March 17, or, as an astronomer might call it, 24 h. of March 16. At 4 p.m. on the 15th she is in conjunction with Jupiter, at a distance of 3° 12′ south of that planet. The one occultation of a star visible during the period of which we are treating is that of the 6th magnitude one, o Arietis, which will disappear at the moon's dark limb on March 12 at 6 h. 51 m. in the evening, at an angle of 115° from her vertex, and reappear at her bright limb at an angle of 344° from her vertex at 7 h. 49 m. p.m.

BREAD AND HONEY.

BY DR. PREVOST.

BREAD and honey: two foods well known to all; the one dry and nearly tasteless, the other soft, sweet, and moist—and apparently very different to one another. Many will be certain to remark, Why couple them together? Surely we shall now see how different they are in their composition, for we know that they are not at all like one another when they are eaten. Such ideas concerning the composition of these two foods are very erroneous, for, instead of being widely different, they are very closely connected. True, there is a difference, to explain which it will be necessary to say a few words about the composition of each. Analyses of perfectly dry bread show that it is made up of about fifteen parts of nitrogenous matter, of three parts of ash or mineral matter, and the remaining eighty-two parts may be considered to be starch. Honey, on the other hand, consists wholly of the sugar called glucose, together with a very small quantity of cane-sugar, which disappears as the honey gets older, and also a very small amount of ash. Now, as our purpose is to show the connection between sugar and starch, we will neglect the nitrogenous matter and the ash in the bread; but it must not be thought that this nitrogenous matter is of no consequence, for, although not present in large quantities, still it is very important, as to it the firmness of head is due: so we will think of a loaf of bread merely as a lump of baked starch. Having thus reduced our loaf to one kind of substance, which is apparently so dissimilar to honey, it will not be uninteresting to trace the history of the origin of each. Meal flour, which, as all must be aware, is obtained by grinding down the seed of a cultivated grass, and has been elaborated by means of the leaves and roots of the wheat plant before deposition in the ear; the roots have supplied the nitrogenons matter and ash, while the leaves have produced the starch, as explained in a former article. Much in the same way as starch is carried up into the ear of wheat, so is the honey carried upwards and deposited in the nectary of a flower, from which it is removed by bees, and stored in the honey-comb. It is not for us to discuss why honey should be formed in flowers, but the reasons are well known, and the purpose is most important. Now, where does the honey come from? When the plant begins to form its flower, which is a preliminary process to the production of fruit and seed, a part of the starch present in the stem becomes soluble, and by reason of certain vital influences, it absorbs a proportion of water, and is converted into glucose; after that it is deposited in the nectary, together with a very minute quantity of an odorous fluid, which gives to honey its peculiar flavour. What, now, is the difference between starch and honey? Why, just a proportion of water, which, by entering into combination with starch, effects in it the great change in its properties with which all are familiar. The tasteless starch of the bread, better known as the "crumb," becomes a sweet and often crystalline substance bearing no resemblance whatever to the original material; and what is more remarkable still, is the fact that both are derived from the carbonic acid of the air, that substance which is obnoxious to man, and which he is glad to get rid of, from which the carbon, having been abstracted, is caused to combine with water. These are not theoretical nor suppositional statements—far from it. A large industry for the production of sugar (glucose) from potato, starch, and maize exists, and the material obtained is employed for the manufacture of spirit. There are many examples of this kind of change of starch into sugar, the best known being the production of sugar by the sugar-cane and the beet; this latter kind, which is so largely manufactured in France and Germany, and from thence imported into England, has to a great extent taken the place of the old West Indian cane-sugar. The sugar-beet, which much resembles the ordinary red beet-root, however, contains no starch in the bulb where the sugar is found, so search must be made for the source whence the sugar comes. The bulb, on examination, is found to consist of cells inclosing a fluid consisting principally of sugar and water, and the walls of these cells are composed of a substance termed cellulose, whose composition is identical with that of starch, but the properties are very different. Cellulose in the laboratory of the chemist can be converted into sugar, but it is not probable that such a change occurs in the beet; for, though possible, this change has not been detected. The more correct supposition is, and it is one confirmed by observation, that the large leaves of the plant, as is the case with other plants, elaborate starch, which, assuming the soluble condition, descends into the bulb, where it is deposited in the cells prepared for its reception; but during its descent it again changes its form, takes up water, and is converted into sugar, and in then it is that cane-sugar which is produced. That this is what occurs naturally is rendered all the more probable by an observation that has been made, which shows that when the plant is in an unhealthy condition, starch is found in the bulb. From this we may, perhaps, infer that the converting powers of the plant have been unable, by reason of ill-health, to change the whole of the soluble starch into sugar; for it must not be forgotten that a certain amount of energy, so to speak, must be exerted to force a proportion of water to combine with starch. A distinction has always been drawn between cane-sugar and glucose, for not only are the properties somewhat different, but the composition also; to produce glucose from starch requires the combination of one proportion of water with one of starch, but for the formation of cane-sugar, only a half proportion of water is requisite. At the commencement of this article it was stated that loaf of bread consisted of starch and nitrogenous matter; but this is only true so long as the loaf is one of dough, and before it is baked, for when it is put into the oven and heated, the starch begins to change, which is indicated by the formation of the crust. Examination by proper means would show that it no longer consists only of the two substances above mentioned, but that a third is now present, namely, dextrine, and dextrine has exactly the same composition as starch. This change may easily be observed by careful heating in, say, an iron spoon over a lamp, a little starch, carefully stirring it the while. Soon a change of colour will be noticed, and when this colour, which should be light brown, is even through the whole mass, the starch will have been changed into dextrine, which will dissolve with ease in water. This alteration is perhaps the most curious of any that have been, as yet, mentioned, for in the dextrine we have the same number of particles of carbon, hydrogen, and oxygen as are in the starch. What has happened that the characteristics of starch should be lost, and new ones assumed, we can hardly tell, but we believe that they have merely been arranged in a different manner, just as a carpenter can from a piece of wood make either a shelf or a box, whichever he chooses; the material is the same, and the quantity the same, but the arrangement is different: so it is with the dextrine and starch; we might also add, so with cellulose, which has, it will be remembered, the same composition as starch, but as we cannot produce cellulose from starch by such simple means as are required to form dextrine from starch, the change is hardly so striking. We have now accomplished the task before us as far as it was possible in a few words to show the connection between bread and honey; and we hope that when any of our readers next consume these two articles of diet, they will not forget that, putting aside the presence of nitrogenous matter, although their palates discover a considerable difference between the two, the chemist only acknowledges the addition of water to the one to produce the other.

THE LONDON LIBRARY.—"If this library," says M. Guizot, "had not existed, I should have felt great inconvenience. It is a very useful library: there are a great many excellent books about English History which I have found there. It is a great inconvenience to me to be obliged to go to the British Museum, and not to be able to work in my own room, with my own books; that is a great part of the pleasure of working." Mr. Leigh Hunt, in his "Stories from Italian Poets," says:—"I cannot, in gratitude for the facilities afforded to myself, as well as for a more obvious and public reason dismiss this preface without congratulating men of letters on the establishment and increasing prosperity of the London Library, an institution founded for the purpose of accommodating subscribers with such books at their own houses as could only be consulted hitherto at the British Museum." Mr. M'Cabe, in the Preface to his "Catholic History of England," states that "he has been possessed of one great advantage. As a Member of the London Library he has had access to, and the use in his own home of, a splendid collection of works. On the shelves of that Library he has found most of his authorities,—the ancient monastic writers, and those authors who afford passages illustrating the facts stated by the chroniclers."

XUM

"Let Knowledge grow from more to more."—Alfred Tennyson.

Letters to the Editor.

Only a small proportion of Letters received can possibly be inserted. Correspondents must not be offended, therefore, should their letters not appear.

All Editorial communications should be addressed to the Editor of Knowledge; *all Business communications to the* Publishers, *at the Office, 74, Great Queen-street, W.C.* If this is not attended to, delays arise for which the Editor is not responsible.

All Remittances, Cheques, and Post Office Orders should be made payable to Messrs. Wyman & Sons.

The Editor is not responsible for the opinions of correspondents.

No communications are answered by post, even though stamped and directed envelope be enclosed.

WAXEN IMAGES OF ENEMIES.

[736]—Mr. E. Clodd might, perhaps, like to know that the making of waxen images to cause death (by piercing or melting) to the person in whose likeness the image was made, was a form of sorcery known to, and practised by, the ancient Egyptians. In Mr. Le Page Renouf's introduction to his translation entitled "An Abstract of a Case of Conspiracy," in Vol. viii. of "Records of the Past," he will find particulars of a case of the kind,* *temps.* Rameses III. I need not, of course, remind him of the Second Idyll of Theocritus.

Amelia B. Edwards.

CHIRPING SPIDER.

[737]—Your correspondent asks if there is a "Chirping Spider" in Britain. I have been an interested observer of the spider family for some years, but never knew one with that accomplishment; there is one, however, which makes a ticking sound like a gentle tap—it is the "death-watch" of the superstitious. It is not very commonly heard, but on one occasion I saw one in the very act. It was done with the right fore-leg, and the wonder is how the effect could be produced by such means. In this way the male spider calls to the female, and it is evident that sometimes he has to call long and loudly. Perhaps "D. M.'s" disturber was only a cricket on the stump.

S. H. W.

STAYS.

[738]—No one has, in the course of the controversy upon the above subject, noticed the very important point, how tight-lacing affects a woman's vital capacity, and I am the more surprised at this, as it is a matter which can easily be settled by means of the spirometer. In my vocation as a voice trainer I pay special attention to breathing, and I find that after the removal of close-fitting stays women register an increase of from 25 to 50 per cent. in their breathing. This speaks for itself, and requires no further comment.

Emil Behnke.

ETYMOLOGY OF MISLETOE.

[739]—The discussion on the right etymology of the word "Misletoe" has greatly interested me, but I do not think that (so far as the original meaning of the word is concerned) any of your correspondents have arrived at the truth. In your issue of Jan. 19, you remark that one "Taranaki," in writing on this subject, has derived it from the Saxon word, *mistil*, sprawler; and you yourself (from your remarks on the meaning of "mizzling rain") seem to favour this derivation.

But I venture to assert (on the authority of the Rev. I. Bosworth, D.D., F.R.S., F.S.A.B., Ph. of Leyden, &c.), that it is derived, not from the word *mistil*, a sprawler, but rather from *mistel*, which means a cloud or darkness. That such a gentle, inoffensive kind of plant as our little misletoe should be called the "twig of darkness" seems at first sight incongruous; but on secondary consideration, it becomes more easy of explanation. It will readily be remembered that it was by a twig of misletoe that Baldur, the Scandinavian Sun-god, was slain; for (as Frigga said to Soki, when he asked her if everything had sworn to do him no hurt) "it (the misletoe) was considered too young to take an oath." But Baldur fell, "and the shadow of darkness covered the whole earth."

G. Clavering Mesnard.

* These particulars are in the fragmentary Lee and Rollin papyri, which are not translated.

PLANCHETTE-WRITING.

[740]—I hope I shall not be taking up too much of your valuable time if I ask you to give me your opinion on the real working agency in the "Planchette." Doubtless you have seen it, so that I need not describe its action. Some time ago I began trying experiments with it, having at the time the full conviction that, where no trickery was involved, the writing was done by unconscious action of the hands of the person who rested them on the machine; but this plausible solution, if correct, would entail new ideas of brain action which would be very curious. I had the fortune to have a lady friend for whom the Planchette wrote wonderfully well at all times, so that I was able to try some curious experiments. On placing her hand on the instrument (which I made myself by drilling a hole in the rim of a small plate and inserting a pencil) and asking a question, the answer was written with wonderful celerity, even faster than ordinary writing, and generally very legibly, though in various handwritings, none in the least resembling in formation of letters (which I consider a curious point) that of the operator herself. The lady herself did not know what had been written till she had read it. On more than one occasion the information conveyed was known only to myself or to some other person in the room, and therefore, on the hypothesis of involuntary action, could only be explained by a sort of Thought Reading.

But the experiment I would particularly call your attention to is this. I had several times mesmerised the lady in question, and as usual in such cases, when asleep she could answer any questions proposed, but had no knowledge on awakening of what had happened in the trance. (By the way, I found that, if she had lost or mislaid things in her waking state she could generally say where they were when asleep.) I thought of the experiment, therefore, of causing her to place her hands on the plate when asleep. On asking a question, an answer was written as usual, and, before reading it myself, I then asked her what had been written, with the full expectation that she would be able to say. *She could not*, however! Now this would seem to prove that the words written were not evolved either from the brain in its normal state, or from its peculiar condition in the mesmeric sleep. We must therefore either allow a *third* state not yet investigated, or come at length to the idea of external supernatural agency, which I am most unwilling to admit. As I have a great respect for your opinion as a candid, unprejudiced scientific man, I take the liberty of asking you what you think of the above experiments, which are, so far as I know, quite original.

A strange point I have observed about the writing of Planchette is, that its character is generally totally opposed to that of the operator. Thus I have seen the most terrible oaths written under the hands of people who would almost die sooner than use such language themselves.

Every new *fact* should be scientifically investigated in my opinion, and the founding of a false theory on real facts should not prevent the facts themselves being allowed and studied. I believe some yet unknown truth lies under the nonsense of spiritualism—if it really be nonsense, and on that point I have not yet seen sufficient evidence to decide, and would require very strong to convince me. Still, here is my fact. I have seen a plate write, in a strange handwriting (and to write rapidly in a strange handwriting is, I think you will allow, almost an impossible feat) words unknown to the person whose hands rested on it. (It is, I believe, impossible for a person to tell a deliberate falsehood when mesmerically asleep, if such proof of my friend's veracity were needed.) As to the matter written I shall say nothing, as perhaps it is not to the point, though interesting to me in the extreme. Now, if you are content to accept the fact on my evidence, how do you explain it?

T.P.B., Lieut. R.A., F.R.A.S.

[Where can one get a Planchette? I know nothing of the weight, structure, frictional resistances, &c., of the thing.—R. P.]

THE BO TREE AND THE GOD OF KNOWLEDGE.

[741]—In January, 1880, I took a trip to Central India, and while there amused myself by visiting Buddhist tombs and temples, and in nearly all I found the Bo or Bodhi Tree represented in sculpture as an object of adoration and reverence. On the Sanchi

Topes, Bhopal State, the Bo Tree appears as one of the principal objects of worship.

The large Tope is the tomb of Ariaparshan, one of the chief saints among the followers of Buddha, who lived nearly 2,000 years ago, and on the lower architrave of one gateway the King, probably Asoka, is represented in the act of dismounting from his elephant to worship the Bo Tree. On another architrave a great number of animals are depicted as marching towards the "Tree" for the purpose of adoring it. On another there is a grand royal procession halting before the "Tree" and worshipping it.

That the Bo Tree still holds its position as one of the most sacred objects in Buddhist worship and is dedicated to the gods I learnt on going into a temple which stands on a rock in the middle of the river Betwa, a tributary of the Ganges in Prince Scindia State. There in the lap of the god Ghanpatti I saw several freshly-gathered leaves, and on asking the Buddhist Priest what leaves they were, he answered "Bodhi Leaves." At my request he gave me three, which I now have. Ghanpatti, the god of Knowledge, [Come! I say, you know!—R. P.] is represented as having the body of a man with the head of an elephant, and is believed to be omniscient, and to possess the power of imparting knowledge to all who earnestly desire it. A. M. L. J.

OPTICAL ILLUSION.

[742]—I had rather a curious experience two or three mornings ago which interested me much, and which I thought might account for at least a few of the many apparitions of which we now hear so much. I therefore send an account of it to you in case you may think it interesting to your readers.

I was training for the "torpids," or heavy eight-oared inter-collegiate races, and had, in accordance with the accepted training rules, to get up at 7 a.m. and go for a run before breakfast. On the first morning of the training I woke up "when all the morn was stilly dark," and as I had got into a bad habit of doing the greater part of my work between 9 p.m. and 2 a.m. I had not much notion of the amount of light to expect at seven in the morning, so I groped about, thinking training rules in general a great abomination, and found that my clock had stopped; therefore, opening my door I went into the passage, intending to look at the clock in my sitting-room. I there saw, as I thought, my friend, who was coming to run with me, standing, his figure well defined against the window of a little room adjoining, the door of which generally stood open. So assuring him that I should be dressed in less than no time, and apologising for being late, I was upon the point of going back into my room, but to my surprise the figure did not answer, but gave a half step backwards, as if hoping to escape notice, I then saw that it was not of quite the same build as my friend, and it struck me that, being earlier than I thought, I had disturbed a burglar in his occupation, so I "went" for him, but instead of getting hold of my man, I came with great violence against the door of the room I had thought open and my burglar vanished into thin air. I saw at once my mistake. Behind me in the passage was a narrow window, and through this a street lamp threw a light upon the door, exactly of the same size, and in a line with the window in the little room, and as I stood between the door and the passage window my shadow was thrown upon the door. So complete was the illusion that when I returned to my original position I could hardly believe that someone was not standing in front of me, for the distance of the lamp, the early dawn, and the colour of the door, which was of stained and varnished deal, gave the shadow a soft outline which looked terribly real. I grant that I was very sleepy, but was sufficiently awake to remember very vividly the estimate I made of my burglar in the moment between discovering him and going for him, which was that he would be exactly as much as I could "tackle," which no doubt he would, being my precise double, for the lamp was so far off as to render him hardly perceptibly larger. When at last I got to the clock in my sitting-room I found that it was not yet six, and so returned joyfully to bed, the next thing I heard being my friend violently banging at my door in none of the best humours at having got up and dressed himself only to find me sleeping peacefully the sleep of the just. AN OXFORD UNDERGRADUATE.

EFFECTS OF BELLADONNA ON THE EYES.

[743]—In a recent number you inserted the experience of a gentleman on putting atropine into one eye; perhaps you may care for the experience of one who has had it in both eyes at once.

I may mention that, like your correspondent, I am assigmatic, and had to put this belladonna into my eye to facilitate the examination of the interior by the then most able oculist alive. The belladonna was put in, one drop in each eye, just before going to bed. There was no pain, and that night the only effect to be noticed was the unusual brilliancy of the eyeballs. When, however, I awoke it was with great difficulty that I could persuade myself of the fact. Everything seemed to be enveloped in a mist, and I could see nothing clearly, except at a distance of about six or eight inches. When I looked at a thing fixedly first of all, all the apparent mist seemed to be whirling swiftly round it, and then gradually stopped, but the thing then appeared double to me. It was at least a week before the effects of the one dose had thoroughly worked off, and during the latter part of that time the movement of the eyeballs gave a most peculiar sensation, as if when I moved them the muscles were trying to keep them back. This sensation was also experienced when I looked from a thing at a distance to something near.

Before I took to spectacles (of peculiar nature to suit my eyes, which are of diff. foci) I again had to use the belladonna, taking to the glasses the morning after the dose, and up to the present time (two years) I experience the above sensations when I take off my glasses. No doubt if I left off my glasses for a week the effects would wear off again. I may add that I never take my glasses off from morning to night. J. H. HODD.

AN EYE FOR BEAUTY.

[744]—In *re* corsets, is, or could, physiology be taught at our great public schools—intelligently taught I mean, so that boys should *understand* the ugliness of pinched waists? As has been well said, what taste can be expected from a lad brought up to admire Eton jackets and tall hats? No wonder he grows up to regard a woman as a doll—pretty only if fashionable. And she will be stupidly fashionable while he admires her for it.

M. McC.

[As a cure, every lad should pass an hour or two twice a week studying the works of great sculptors, and learning the dignity, beauty, grace, and purity, of the unadorned human body. If I were to count the hours I passed thus myself, many would ask with wonder how I found the time. My answer might perhaps be that I saved it by eschewing dictionaries. But seriously: I value few portions of my education more than this, the least laborious and most pleasant.—R. P.]

A PUBLIC RIGHT.

[745]—You spoke in the public interest with regard to Kew; will you help us to greater enjoyment of another national possession? I state the case briefly, and hope to enlist your sympathy.

By procuring an order, it was possible, two or three years ago, for a few people to see the magnificent collection of Turner's water-colours and drawings, arranged in portable cases by Mr. Ruskin, and stored in a room below the National Gallery.

As an improvement on this plan, a certain number of the drawings are now placed in cases, and the room is open to the public. These drawings are changed every three months, and it is supposed that residents in London may in time see the whole collection (some 700 or more), but the mass of drawings in the cases are now inaccessible.

Therefore, people who don't reside in London, but who wish to study the great English master when they do go there, must be content with just the examples that happen to be out.

Secondly.—Those—I believe an increasing number—who wish to possess some of Mr. Ward's or Miss Jay's admirable copies, have no power to search the cases for a subject.

Thirdly.—The same limitation must interfere, I imagine, with students who do not know by name the drawings concealed from view, and therefore cannot say which they want.

Lastly.—The collection specially selected for educational purposes by Mr. Ruskin is now screwed to the wall in a room so dark that no one can see it, much less copy from it, and the resources of the Gallery are not equal to the labour of moving one of these drawings at the request of a student. The study of them is practically forbidden.

Mr. Ruskin protested in his catalogue against the dark chamber. I am told that for some time the catalogue was not sold in the room because of this protest. Happily it is there now.

The authorities may consider Turner's works more unique than admirable, but they are national property, and those who love them should claim access to them. Of course, every reasonable precaution must be taken to ensure the safety of the drawings, but as the attendant is in the room as of old, a limited number of orders might be issued daily, admitting the holders to see the cases.

A small table placed in each window of the light room to accommodate them would not trespass too much on the very limited space. M. McC.

[I insert "M. McC.'s" letter, but without much hope of any useful result. Officials scarcely ever understand that—while they accept State salaries—they are the paid servants of the public.—R. P.]

DESERT OF ATACAMA.

[746]—I have lately been conversing with a gentleman who was at one time vice-consul on the West coast of South America, and who had made an extensive and careful survey of the Desert of Atacama, in Chili. I am anxious to learn what were the causes which produced that desert; and, not finding any account of them in any books to which I have access, I would like if you, or any of your geological friends, would favour me with an explanation.

What this gentleman has told me is, that for more than a hundred miles south of Pisco, and again for seventy miles north of Canete, there is absolutely no vegetation whatever, but that numberless water-courses, now quite dry, can be clearly traced running up into the mountains, some of them, in their lower ranges, 1,500 to 2,000 feet in depth, and one of them two miles in width; and that at their mouths, towards the sea, there are great accumulations of boulders, gravel, and sand, sometimes running far out below the sea, and showing a depth of cliff, where they have been cut into by the sea, of 300 feet or so.

Along the banks of these water-courses there are found millions of human bodies interred in the sand, with their implements for hunting and fishing, where now there is not a blade of grass or drop of water within immense distances.

On ascending the mountains to the east of this desert—the Sierra of San Andreas—near Islay, he could trace these water-courses to great heights—gradually diminishing, of course, in depth, and bifurcating into small tributary depressions as he ascended. In one place he came upon what appeared to be the bed of an ancient lake, now quite dry, at a height, as his Indian guide assured him, of 14,000 feet (?) above the level of the sea.

Along the sides of the deepest ravines he found terraces—terrace above terrace—rising sometimes as high as 1,000 feet above the bottom of the ravine, and which he believed were the remains of aqueducts for bringing the water from the higher to the lower levels for the purpose of irrigation.

From all these facts he concludes that this desert, in at least the mouths of its great ravines, must at one time have been highly cultivated and populous; and what he and I would like to know is, what brought about so great a change? Can it have been that this lower flank of the Cordilleras is much older than the higher ranges to the east, and that therefore the rain-clouds which now discharge themselves upon the higher range, had at one time discharged upon the lower? Senex.

[It is not quite clear what connection exists between the desert of Atacama, in Chili, and the desert region around Canete, Pisco, and Islay, in Peru.—R. P.]

LETTERS RECEIVED.—CONTENTS NOTED.

F. R.—J. N. D.—Faciebat—Y. L.—E. H. M.—J. B. Cann—F. C.—Tekel—J. E. S.—J. Pocock—Jane Johnson—W.—F. W. Ashley—W.—An Admirer of a Small Waist—A. J. Maas—A Native of Wales—E. Eggenschinler—R. B.—T. C. S.—H. C. Wilmot—L. F. Whitmore—Acoustics—C. M.—W. B. K.—R. G.—G. S. Coombe—W. G. Rolfe—C. W. Bourne—Undergraduate—H. C. Dent—Stargazer—Constant Subscriber—G. F.—S. E. Clarke—E. J. L.—More Light—J. O. K.—R. N.—J. W.—A. C.—Arthur—W. M.—P. R.—Indian—C. W. B.—J. S.—S. S.—A. W. C.—H. J. S.—G. S. G.—A. S.—W. Moor—W. Sunter—J. G.—C. Reeves—H. W. M.—Zamiel—W. H. A.—Another Observer—W. A. F.

Mr. C. F. Brush, the inventor of the dynamo and arc lamp named after him, has taken out a patent for a system of storing electrical energy. It occupies 46 pages of print, and we hope to be able to refer to it more fully at an early date.

Mr. W. H. Preece, F.R.S., addressing the Institute of Civil Engineers on the 15th ult., said that there are at present in use in the postal telegraph system, 87,221 Daniell cells, 56,420 Léclanché cells, and 21,846 bichromate (Fuller) cells. He is also credited with the somewhat remarkable statement that, "Thanks to such expeditions as that of H.M.S. *Challenger*, the floor of the ocean is becoming more familiar than the surface of many continents."

It is very interesting to note that Messrs. Chubb & Sons turn out yearly about 1,000 safes, strong rooms, and iron doors, and 40,000 locks. Over 1,000,000 of the patent detector locks have been made. There are 200 men employed, all on piecework, and the average service of each man is said to be seventeen years. This indicates a satisfactory state of things all round. One of the latest productions is a safe weighing nearly twenty tons, made for the Government of the Argentine Republic. It is estimated to be large enough for the storage in bags of £18,000,000 in gold.

Our Mathematical Column.

A MATHEMATICAL LETTER (A_1).

Turning over some of the earlier pages of Knowledge, I came upon your article on the interesting curve called "the Witch of Agnesi"; and this brought to my mind a reminiscence of old Cambridge days, followed by other reminiscences which, if you will allow me a page in your periodical, may be amusing to your readers.

You remember our Sadleirian Lecturer in '59? *De vivis nil nisi bonum.* I hope he will forgive the confession, but I know the culprit who sent him the valentine. It was very harmless: simply this, "$r = a(1-\cos\theta)$, from your loving $xy^2 = 4a^2(2a-x)$." It being St. Valentine's day, I had the satisfaction of seeing him trace the former of these (the Cardioide) upon receiving the letter in Hall. The latter, however (the Witch of Agnesi), was not recognised until the pastry made its appearance, when a loud guffaw proclaimed that enlightenment had come. How he used to trouble us with his pet subject, the Golden Number! There was nothing he was not capable of turning into mathematics. "Magistrates conniving at certain periodical religious riots" (so ran one of his Little-go questions in allusion to the disturbances taking place at St. George's-in-the-East), "fined the offenders inversely in proportion to the damage done," &c. But there never lived a sounder mathematician. It was he who first really brought home to the Little-go candidates the fact that division embraces the dividing of concrete numbers by concrete numbers—a fact which, appearing in one of Mr. Gladstone's speeches, was challenged by a leading Member of the House of Commons, and was settled by an appeal to Mr. Fawcett, as a Wrangler—and the form of question by which the Little-go mind was enlightened was as follows:—Find the value of

$$\frac{9a\ 4r}{2a\ 3r} \times \frac{3d\ 16h}{15h\ 20m} \times £3.\ 17s.\ 6d.$$

And then what devils he used to turn out in May! I ask your readers' forbearance until I have explained, as the following incident reminds me that my language may be misunderstood. A couple of Johnians in a railway carriage on their way "down" were discussing their recent experiences. "Did you get out the second devil?" asked one. "No," replied his companion; "I worked at it for an hour-and-a-half, and could do nothing with it; but I got out the last two." The horror-struck look of an old lady in the same compartment, who changed her carriage at the first opportunity, was quite lost upon the students. Be it explained, then, that in former days a paper of seven stiff equations was set at the May examination at St. John's, which were universally referred to as "the seven devils"—so universally, that I believe the phrase passed current among the examiners themselves. Would your readers like to see a sample? Here is one,—

$$\frac{1}{5}\cdot\frac{(x+1)(x-3)}{(x+2)(x-4)} + \frac{1}{9}\cdot\frac{(x+3)(x-5)}{(x+4)(x-6)} - \frac{2}{13}\cdot\frac{(x+5)(x-7)}{(x+6)(x-8)} = \frac{92}{585}\ *$$

The last three equations, if I remember aright, were problems, and were called black, as opposed to blue devils. [They were so.—Ed.]

Speaking about problems, I remember that one of our lecturers gave us some instruction on the subject of betting, which has also been discussed in your pages. The problem given was in this form: "The odds against a horse (A) winning are a to 1; against B winning, b to 1; against C winning, c to 1, and so on. Prove that in order to win for certainty P pounds, a man must back A to the amount of

$$P \div (a+1)\left\{1 - \frac{1}{a+1} - \frac{1}{b+1} - \frac{1}{c+1}, \text{ \&c.}\right\}$$

and B, c, &c., for like amounts, putting b, c, &c., for a in the unsymmetrical part of the above expression."

The gentleman from whom I received the above was so completely saturated with mathematics that he described three young ladies in a family, who strongly resembled one another, as Miss Richardson, Miss Richardson *dash*, Miss Richardson *double dash*; and upon being questioned one day as to the cause of his apparent ill-health, said, that "he had passed a dreadful night: he had dreamed that he was under the sign of the square root and couldn't be extracted." I conclude with two ancient questions for your readers.

1. If a man be placed on a perfectly smooth horizontal table, how can he get off?

2. Explain how the juice collects in the cup placed inside a fruit tart—(α) when the tart is air-tight. (β) when it is not.

N.B.—The case of the tart being more than 32 feet high may be neglected. A Wrangler.

* The devil may be expelled from this particular abode by regarding x^2-2x as the unknown, and noticing that

$$\frac{1}{5}+\frac{1}{9}-\frac{2}{13}=\frac{92}{585}$$

R. P.

Our Whist Column.

BY "FIVE OF CLUBS."

THE critical moment in almost every hand of Whist is that when one or other side enters on the trump lead. This may occur early: perhaps at the very beginning, when one side or the other has a decided superiority in trumps; or in the middle of the game, when one side or the other, having established a suit, and being well protected in their adversaries' suits, sees that their trump strength, reinforced by their strength in plain suits, gives promise of wresting the command of the hand from the other side; or the strength in trump and plain suits may be so disposed that neither side cares to lead trumps till towards the end of the hand; or both sides may find advantage in reserving trumps for ruffing; or two partners may try to establish a cross ruff, throwing the command of trumps, if they succeed, into their opponents' hands, but safely enough, because more tricks are usually gained by the cross ruff than the opponents can afterwards make out of their suits, cut up by the ruffing game; so that, lastly, a trump lead may be purely defensive, made simply to prevent a cross-ruff from being established.

The skill of a Whist-player is shown more, perhaps, by his aptitude in selecting the proper moment when trumps should be led, or the enemies' strength in trumps reduced by forcing, or their lead of trumps delayed by properly placing the lead, than by any other parts of Whist strategy. And I would at the outset carefully caution the learner against falling into the habit of regarding the use of trumps to be so pre-eminently that indicated by the book-authorities, that all other uses should be considered relatively unimportant. It may be true that the chief use of trumps is to extract the enemies' trumps so as to bring in a long suit; but this use, though more important than any other considered separately, is not more important than all the others put together, as many book-players seem to imagine.

It should be remembered, indeed, that in the majority of hands no long suit is brought in, the ending depending simply on the correct play or skilful finesse of the cards remaining in hand, which may be the fragments of suits never very long or strong, and broken up through discards enforced by the necessity of protecting other suits. To adopt as rules of play a system depending on what happens often enough indeed, but still only in a minority of all the games played, is unsafe; yet many follow the rules for trying to bring in a long suit, as if this were the common end of every hand.

Let it be remembered that though leading originally from the longest suit, discarding from the shortest (if trumps not declared against you) and other such rules, are good enough in the early stages of the play of a hand, because they bring the partners into alliance, so to speak, they must not be held to sanction the general principle of playing to bring in a long suit. This is in reality playing a forward game, and a great number of hands require backward, or defensive play, while the majority of hands do not justify forward play. You show your long suit and your partner shows his, or you learn his from the play of the enemy or from the discards, and you presently get an inkling as to the strength of the several suits in the different hands. But you must not run away with the idea that so soon as you know this, the time has come to scheme for the bringing in of a long suit which you or your partner may possess. On the contrary, it is as likely that by this time, you will have found that the measures good for bringing in your suit, are as good for bringing in a suit of the enemies', and that the enemies' suit and not yours is the one which would probably be brought in. And it is more likely than not, that either your chance is thus unfavourable, or, though not bad in itself, it is yet not good enough to justify any attempt at a forward game.

At such a stage in the game, if you find reason to think that you and your partner between you can hold your own fairly against the enemy in trumps, and there is no chance of establishing a cross ruff, it may be well to follow the rule not to force partner if weak in trumps. But if it has become clear that your partner as well as yourself is weak in trumps, you may fairly reason that, since it is the enemies' game to prevent your trumps and your partner's from being used in ruffing, it can hardly be bad policy to force your partner. For though the chief object of leading trumps is undoubtedly to draw out trumps and bring in a long suit, there is another very important object, viz., to draw out trumps lest they be used in ruffing. After all, you can do very little harm, even if your partner's strength is such that he prefers to pass the trick. He can discard a useless card, if he prefers that course; but if, like yourself, he is weak, he can make a trick with a trump which would otherwise have simply fallen to the enemy. He may, perhaps, be found also with the King card and another of one of the adversaries' suits, in which you may be short, and may play that suit (King card first, of course), giving you the chance of forcing him again. If you can make two or three tricks thus with your weak trumps, you may be content to give up any attempt to face the enemy in trumps—especially as, when they do get in, they will hardly be able to avoid letting some of their trumps fall in pairs to none from you and your partner.

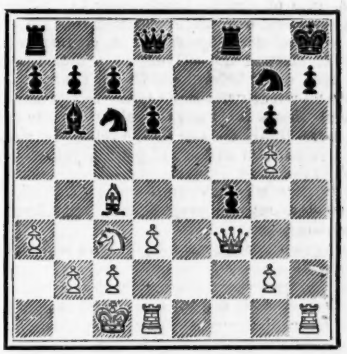
(To be continued.)

Our Chess Column.

BY MEPHISTO.

END OF AN ACTUAL GAME.

AMATEUR.
BLACK.



WHITE.
MEPHISTO.

In this position White announced mate in six moves, playing as follows:—

1. R tks P (ch) K takes R	4. R to R7 (ch) K takes R
2. R to R sq. (ch) Kt to R4	5. Q to R3 (ch) K to Kt2
3. R tks Kt (ch) K to Kt2 (best)	6. Q to R6 mate.

On February 17 Mephisto played against twenty members of the North London Chess Club twenty simultaneous games. Play began at 7.15 p.m., the first game was finished at 7.45, the twentieth at 10.15. Thus in three hours the twenty games were concluded. Of that number the single player won sixteen and lost four.

Taking the average number of moves per game at thirty, Mephisto must have moved 600 times, or at the rate of 200 moves per hour.

The question has often been asked, what is it that constitutes a strong player? We venture to assert that it is not "strong reasoning alone," but also the facility for accumulating experience by a good memory, both combined produce in course of time a quick perception of position, commonly called "instinct," and very commonly misinterpreted. The greater the experience, and also the more the reasoning powers are exercised, the quicker will a person be able to judge which is the right thing. If, therefore, a strong practitioner perceives a fallacy, he will seize upon it at once, and with a rapidity surprising to others less gifted than himself. Mephisto was guided in his play by "what comes nearer to instinct than to reason," the result proving that it is "instinct" as defined above which is the chief guide, and it is left to the reasoning powers to follow up and examine what the instinct has pointed out as a likely course, which in some instances requires modifying, and in but very few instances requires to be rejected. Undoubtedly, reasoning increases the strength of play, but our argument is that the greater part of a player's judgment of a position is supplied to him instinctively, as is amply proved by the play in which reasoning powers, owing to the rapidity of moving, could not have been exercised to any appreciable extent. Nevertheless, the result proved satisfactory.

XUM

We give a specimen game, played against one of the strongest players of the team.

White. Mephisto.	Black. Amateur.	White. Mephisto.	Black. Amateur.
1. Kt to QB3	P to K3	16. P to KB3	R to B4
2. P to Q4	P to Q4	17. Q to Q4	Kt to Q3
3. P to K3	Kt to KB3	18. Kt to KB4	R to KB3
4. B to Q3	P to QB4	19. P to KKt4	P takes P
5. P takes P	B takes P	20. P takes P	P to QR4
6. Kt to KB3	Castles	21. P takes P	R takes P
7. P to QR3	Kt to QB3	22. P to Kt5	R to KB4
8. P to QKt4	B to Q3	23. Kt (B4) takes KtP	Kt to B5
9. B to QKt2	Kt to K2	24. Kt takes Kt	P takes Kt
10. Kt to K2	Kt to KKt3	25. Kt to KB4	QR to K4
11. P to KR4	P to KR4	26. Castles QR	Q to QR5
12. KB takes Kt	P takes B	27. Q to QB3	B to Q2
13. Q to Q3	Q to K sq.	28. Kt to Kt6	B to B3
14. B to K5	B takes B	29. R to Q8 (ch)	Resigns.
15. Kt takes B	Kt to K5		

We think the views of Dr. Siemens about instinct will require modifying. A rule of thumb practitioner in mathematics (an accountant) has supplied us with information that we vainly sought for in various well informed quarters. A correspondent recently inquired by what method the players in a tournament could be paired against each other beforehand for all the rounds. A friend of ours who saw all about "the cow's tails" in ten seconds, and who is a good mathematician could not tell, chess players could not tell, till at last Mr. Lord kindly showed us the following simple method. Provided you have an even number of players you proceed as in the following example:—

We have six players, who have to play one game with each other, and we wish to find out the precise date beforehand when each man has to play the other.

We draw a diagram for six rounds, and we will call the players a, b, c, d, e, f:—

	a	b	c	d	e	f
a	—	1	2	3	4	5
b	1	—	3	4	5	2
c	2	3	—	5	1	4
d	3	4	5	—	2	1
e	4	5	1	2	—	3
f	5	2	4	1	3	—

We fill in the six players' names horizontally, and also down the side of the diagram. We next fill up the blanks, that is, the squares on which a player stands opposite his own name, such as a opposite a, and b opposite b, &c. Then, as there are six players, therefore five rounds, we proceed with a against b, marking him down for the first round, a c for the second, a d for the third, a e for the fourth, and a f for the fifth. The same figures that stand on the horizontal line may be put in the downward squares, we therefore again put 1 on b a, the first square of the second line, 2 on c a, the first square of the third line, 3 on d a, 4 on e a, and 5 on f a. The reason for this is obvious. We have fixed that a should play e on the fourth round, then of course e also has to have 4 underneath a as well as a has a 4 underneath e.

Now we proceed with the second line, beginning with the first figure. We must follow the rule of counting continually up to 5, but the next square being a blank we must count it 2, but place the number in the last square of the line, this being the rule. We therefore place 2 on b f, the last square of the second line, and proceed with 3 underneath b c, 4 underneath b d, and 5 underneath b e. Now as in the case of a, so also with b; we place the figures 3, 4, 5, 2 downwards on the second line, that is, all underneath b. Now we proceed with c. The last number being 3 for the blank, we must put a 4 on the sixth square underneath c f, and return to the fourth square with 5, and underneath c e we must again put 1. We again place 5, 1, 4 downward, underneath the third squares d c, e c, f c. On d, the blank stands for 1 at the end, and in the fifth squares comes 2. Putting 2, 1 downwards, we have only one square to fill up on e with the number 3, placing the same number on the only vacant square, f e.

By drawing a diagram for themselves, our readers will find that it takes less time to do it than it does to explain. Thus in a few minutes by this simple process a large number of players can be paired together beforehand with accuracy for all the rounds. There merely remains then the date for each round to be given underneath, then a player can see at a glance whom he has to play on every playing day.

This is indeed a very useful method, which, although worked out by rule of thumb, must, nevertheless, be capable of complex mathematical explanation, which, we confess, we do not see, but which "is a matter of detail," as Mr. Proctor would remark.

SOLUTIONS.

PROBLEM No. 75, BY C. PLANCK, p. 108.

1. Kt to K5	K tks KKt, or		K takes QKt
2. Kt to Q7 (ch)	K to Q5, or (*a*)	2. Q to R3 (ch)	K to Q5, or (*b*)
3. Q to Q2 mate		3. Kt to B3 mate	

(*a*) If 2. K to Q3. 3. Q to R6 mate.
(*b*) If 2. K to Kt3. 3. Q to K3 mate.

Problem No. 76 can be solved by 1. R to KB sq, or 1. B takes P

ANSWERS TO CORRESPONDENTS.

*** *Please address Chess Editor.*

A. J. Marritt.—Problem No. 77, if 1. B to Kt4, K takes Kt. 2. Q to Kt5, K takes Q?

J. R. G.—There is no recognised opening beginning with 1. P to R4. We do not think much of it.

J. Hughes.—Problem No. 75, if 1. Kt to K7, K takes Kt. 2. Q to K3 (ch), K to Q3, there is no mate. No. 76, if 1. Q takes P, KKt takes Kt, and mate is impossible.

Problems received with thanks from Herbert Jacobs, J. Hughes, and G. W. Mitchell.

Leonard B. Page.—Solution incorrect.

Correct solutions received.—Problem No. 74, John Lonsdale. No. 76, J. S. Maskery, Berrow, M. T. H. No. 77, R. J. P., J. Hughes, Darby and John, T. Adamson, T. T. Dorrington, John, H. M. Prideaux, D. Duggan, Roland Mott, G. W. Mitchell, John Watson, Clarence, W. Stettin, Berrow, M. T. Hooton.

In the press, "Chess Life Pictures," containing biographical sketches of great masters. By G. A. MacDonnell, B.A., with illustrations by Wallis Mackay. Kelly & Co., Great Queen Street.

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